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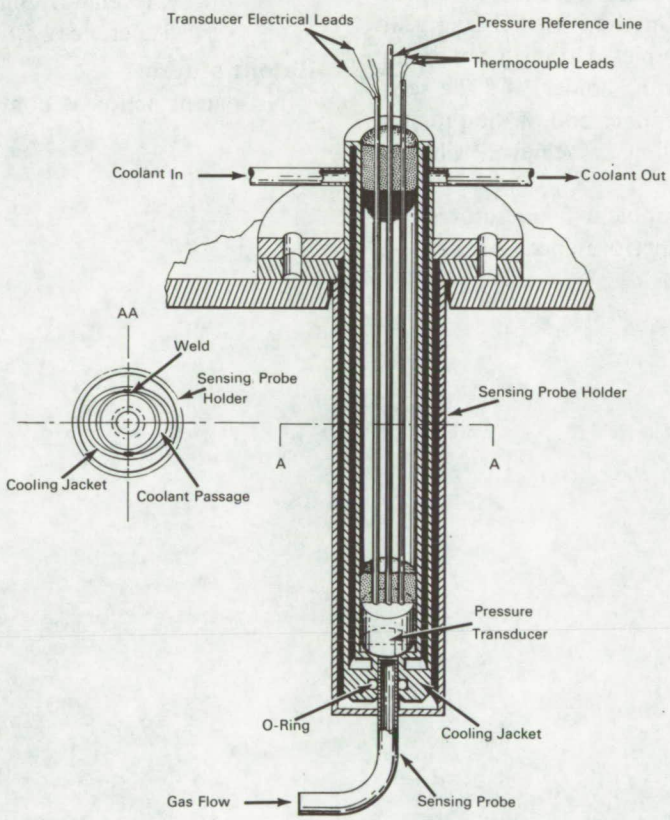
Brief 68-10370

NASA TECH BRIEF

Cooled Miniature Pressure Transducers Effective at High Temperatures



A compact water-cooled mount for miniature pressure transducers, which has been developed, permits locating the transducers in hotter and more confined environments than was previously possible. Compactness was attained by utilizing pressure transducers ¼ inch in diameter by ¼ inch in length, with connecting leads and reference pressure tube extending from the rear. Good response at frequencies to several hundred Hertz is obtained by locating the pressure transducer near the mouth of the sensing probe.

The cooling jacket comprises two concentric tubes. The inner tube is circular, with an inside diameter slightly larger than the outside diameter of the transducer. The outer tube is flattened to an elliptical cross section having a minor axis equal to the outside diameter of the inner tube. The two tubes are roll

(continued overleaf)

welded or spot welded together at their line of contact to provide parallel coolant supply and return passages. The coolant passages are connected at the inner or sensing end where the inside tube is reduced in diameter to fit around the transducer. The cooling jacket extends past the end of the transducer, so that the gas adjacent to the pressure diaphragm is also cooled. The transducer rests on a 0.010-inch-wide rim at the end of the inner tube. A thermocouple is attached to the transducer case. Transducer operating temperature is used to determine the coolant flow rate required and to correct the pressure measurements.

To assemble the device, the transducer is positioned in the inner tube which is then filled with an epoxy-type cement. This both seals the tube and prevents vibration of the leads, reference tube, and thermocouple. An alternate method uses O-ring seals and a capped tube. The completed transducer mount is slipped into the sensing probe holder, and the sensing probe is inserted into the inner end of the pressure transducer mount. Gas sealing is achieved with an O-ring.

Initial testing at various ambient temperatures and flow rates showed excellent performance. As a result, approximately 50 units of lengths ranging from 1.2 to 9.4 inches were built, and are being used in the testing of advanced aircraft engines. Gas temperatures at the probe locations range upward of 1000° F.

Notes:

1. This instrumentation made it possible, for the first time, to measure quantitatively high-frequency total pressure fluctuations resulting from rotating stall in an axial flow engine compressor. Measurements have determined the initial location of stall and followed the progression of a stall through the remaining stages of the compressor.
2. Details may be obtained from:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B68-10370

Patent status:

No patent action is contemplated by NASA.

Source: E. C. Armentrout
(LEW-10401)